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HISTOPATHOLOGICAL CHANGES IN THE GILLS AND MANTLE OF FRESHWATER BIVALVE *PARREYSIA CORRUGATA* (MULLER, 1774) TREATED AGAINST PESCITICIDE 36% MONOCROTOPHOS

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Monocrotophos, Histopathology, Ctenidium, Mantle and *Parreysia corrugata*

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ABSTRACT

The present study aimed to investigate the possible effects of acute exposure of Monocrotophos on histopathological changes in gill and mantle tissues of freshwater bivalve *Parreysia corrugata* . Animals were exposed to sub lethal concentration of 0.1 ml per liter (equivalent to 1 ppm) of Monocrotophos showed the results of histopathological impact on gills and mantle of the mussel *Parreysia corrugata* . The study revealed that gill lamellae, cilia, heamolymph vessels and branchial nerve were badly affected by Monocrotophos and the severity of the effect was time dependent.

INTRODUCTION

Abundant use of fertilizers and pesticides became essential for better agricultural practices in most of the developing countries including India. Organisms living in aquatic ecosystem are exposed to contaminants that move relatively quickly through this system. The pesticides became one of the leading polluting agents of aquatic ecosystem (Phirke, 2008).

The use of agrochemicals in the field has the potential to change the aquatic medium affecting the tolerance limit of aquatic fauna and flora as well as creating danger to the ecosystem and these agrochemicals adversely affects the non-target organisms, especially plankton and fish (Joseph and Raj, 2011).

Pesticides are major cause of concern for aquatic environment because of their toxicity persistency and tendency to accumulate in the organisms (Joseph and Raj, 2010). Pesticides and heavy metal salts are commonly pollutants of freshwater ecosystems where they induce adverse effects of the aquatic biota (Chourpagar and Kulkarni, 2011).

Many investigators have reported toxicant induced histopathological abnormalities and regenerative changes in certain tissues of various animals (Goel and Garg, 1980 and Bhattacharya and Ray, 1984). Histopathological abnormalities caused due to toxicity of heavy metals in animals have been reported earlier (Shastry and Sunita, 1984; Shrivastava and Maurya,1991).

Histological study provides data concerning tissue damage at structural and functional level (Sprague, 1971) in tissues and organs and may provide the site of the action of the toxicant. Histopathological changes in various tissues affected of various compounds of the heavy metals are mainly studied in invertebrates, amphibians and mammals. Nickel Toxicity to humans, includes carcinogenicity, reproductive and developmental toxicity, neurotoxicity, and acute toxicity. Heavy metal accumulated in benthic organisms might be further biomagnified in food webs. Hence consummation of such kind of animals may form a significant pathway in the human being and creating public health problems (Medeiros *et al*., 2012). Presently an effort has been taken to evaluate the histological changes in the gills and mantle of freshwater bivalve *Parreysia corrugata* treated against 36% of the pesticide Monocrotophos.

MATERIALS AND METHODS

Acclimation

Live *Parreysia corrugata* were collected from the Lower Anicut Reservoir of Kumbakonam, upon arrival to the laboratory to healthy organisms were segregated for the experimental

purposes. To avoid the fungal contamination glass aquaria were washed with 1% $KMNO_4$ and dried in the sun light. Healthy bivalves were then transferred to glass aquaria containing dechlorinated tap water. The characteristics feature of the tap water as follows:

Table 1: Tap water characters

Temperature	28 ± 2°C
Total hardness	518 ± 23 mg/l
Oxygen	5.6 ± 0.2 mg/l
Salinity	1.2 ± 0.13 ppt
P^H	7.8 ± 0.04

Mussels were acclimatized to laboratory conditions for 5 to 10 days prior to experimentation. The rate of mortality during acclimatization was less than 10%.

Taxonomy of the experimental Mussel:

Phylum : Mollusca, Linnaeus, 1758

Class : Bivalvia , Linnaeus, 1758

Sub class : Palaeoheterodonta , Newell , 1965

Order : Unionida , Stoliczka , 1871

Family : Unionidea , Fleming, 1828

Genus : *Parreysia* Conrad, 1853

Species : *Parreysia corrugata* (Muller 1774**)**

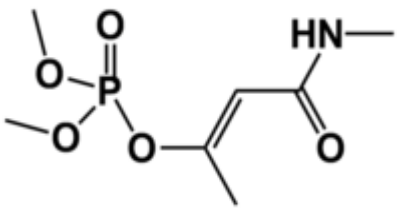
Characteristics feature of Pesticides:

Chemical name : Monocrotophos

Synonyms : Phosphoric acid,
dimethyl [1-methyl- 3- methylamino)
-3-oxo-1-propenyl] ester;
(*E*)-phosphoric acid dimethyl ester,
with 3-hydroxy-*N*-methylcrotonamide;
Azodrin, Nuvacron

Molecular formula : C7H14NO5P

Structural formula :



CAS number : 6923-22-4

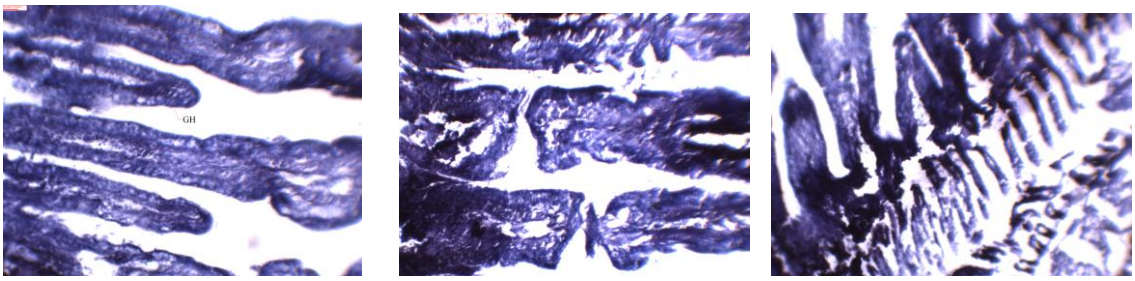
Molecular weight : 223.2

Boiling point	: At 0.07 Pa:125oC
Melting point	: 54-55oC
Vapour pressure	: 3 x 10-4 Pa
Solubility in water	: Miscible
Log Poctanol/water	: -0.22
Conversion factors	: Not applicable

The active acclimated bivalves of approximately uniform size were selected for experiment. Prior initiation of experiment, the bivalves were divided into two groups , first group of bivalves was maintained as control whilst the second group was exposed to the pesticide sub lethal dose of Monocrotophos 36%.EC.(0.40ppm) for 10 days in the captivity.

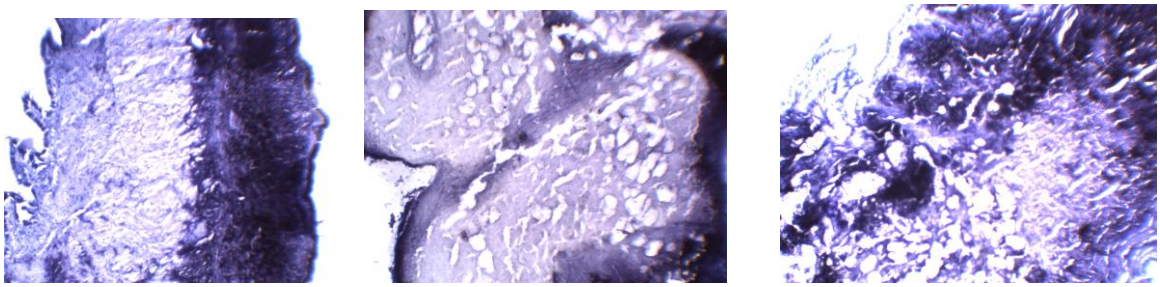
Bivalves maintained in the experimental and control tanks were dissected after 5 and 10 days of interval. The gill and mantle were fixed in Bouie's fluid, for 24 hrs, the tissues were washed and dehydrated in alcohol grades, cleared in toluene and embedded in paraffin wax (58-60°C). Prepared blocks of tissues were cut at the thickness 6µ. Stained slides with serial sections were examined under light microscope to analyses the histopathological changes in the gills and mantles in the tissues of bivalves from both groups. *i.e.* control & exposed were screened and photomicrographs are presented in the plates I and II.

PLATE I 1 (a) section of control gill, 1(b) section of gill after exposure for 5 days to Monocrotophos 36%.EC.(0.40ppm) and 1 (c) section of gill after exposure for 10 days to Monocrotophos 36%.EC.(0.40ppm)



1 (a) 1(b) 1(c)

PLATE II 2 (a) section of control mantle, 2(b) section of mantle after exposure for 5 days to Monocrotophos 36%.EC.(0.40ppm) and 2 (c) section of mantle after exposure for 10 days to Monocrotophos 36%.EC.(0.40ppm)



2 (a) 2 (b) 2 (c)

OBSERVATION AND RESULTS

The animals exposed to Monocrotophos and Nontreated *Parreysia corrugata* showed histomorphological differences in their tissue architecture as fallows.

Histology of gills

Histologically, each gill or ctenidium consists of two gill plates or demibranchs. Each gill plate is formed of two similar flaps or lamellae. They are joined to form water tubes opening into the mantle cavity. Lamellae are formed of numerous gill filaments which contain holes called ostia. The gill filaments are covered by different kinds of cilia and supported by two chitinous rods. The space between two lamellae of a gill plate contains blood vessels.

Plate 1a shows histology of gills of bivalve in control group. Toxicity effect of gills for 5 and 10 days showed histopatological changes in their structure as shown in plate 1b and 1 c respectively.

Monocrotophos caused severe damage to cilia, gill filaments , branchial nerve , heamolumph vessels. Cytoplasam showed disintegration due to swelling in respiratory epithelium. The blood vessels were ruptured causing hemorrhage. Some cells and nuclei were observed in abnormal shape.

Histology of Mantle

In museels the mantle contains most of the gonad. gametes proliferate with in the mantle and are carried along ciliated channels to paired gonoducts that discharge into mantle cavity. After mussels have released their gametes the mantle is thin and transparent. The mantle is not only the site of gametogenesis but is also the main site for the storage of nutrient reserves, especially glucogen.

Monocrotophos dose for 5 and 10 days showed histophathological changes in their structure as observed in the plate 2 b and c respectively. Monocrotophos an induced significant pathological change in histology of mantle storage seriously reduces glycogen energy reserves in heavily infected experimental mussels. This can lead to disturbances of gametogenesis and possible sterilization and death.

DISCUSSION

In bivalves and gastropods, the digestive gland is the major site of heavy metal storage (Simkiss and Mason, 1983). The heavy metals are able to bioconcentrate in the animal tissues. Light microscopic structure of the digestive gland reveals the toxic effect on acute and chronic exposure to lethal and sub lethal concentrations of metal contaminants at the cellular level. Main histopathological features can be manifested as increase in tubular lumen

diameter, irregular shape of digestive and basophilic cells and presence of vacuoles and detachment of tubular teguments. Owing to the excessive use of pesticides, the environment and water resource are being polluted, thus endangering aquatic life directly and human life indirectly (Gill *et al.*, 1988). Chaudhari (1988) reported many behavioral changes and tremendous mucus secretion in pesticide exposed snail *Bellamya bengalensis.*

(Milan and Mulla, 1991) studied the effect of pyrithroid insecticides on non-target invertebrates in aquatic ecosystem and noticed the population recovery or affected species to pretreatment levels. The susceptibility of animals varies from pollutant to pollutant.

Mucus secretion was observed in *Corbicula striatella* on exposure to pesticides (Jadhav, 1993). In the present study it was observed that copious mucus secretion was seen in animal exposed to triazophos, while little mucus was secreted in thiamethoxam exposed bivalves.

The poisoning by pesticides from agricultural fields is a serious water pollution problem and its environmental long term effect may result in the incidence of poisoning of fish and other aquatic life forms (Jothi and Narayan, 1999).

Extensive studies have been carried out all over the world on for the effects of pesticides on aquatic organism (Cripe, 1994; Shanmugam *et al.,* 2000).

Gulbhile (2006) studied mercuric chloride exposure on *Lamellidens Corrianus*, the lamellae of gill showed various changes such as rapture of the ciliated epithelium, increase in the size of lamellae, increase in space between the inter lamellar junction and increase in space between the water tube and inner lamellar junctions.

Normal structure of gills totally damaged or disturbed due to mercuric chloride showing fusion and atrophy of secondary gill lamellae, displacement and necrosis of outer layer of gill lamellar epithelium. After s24 to 96 hours of exposure to mercuric chloride the change in cytoarcitecture of gill *Lamellidens Corrianus* were more severe as compared to those bivalve exposed to mercuric chloride.

Jawale (2006) studied hepatopancreas of bivalve, *Lamellidens corrianus* after chronic exposure to lead and zinc, the marked histopathological changes induced exhibited an initial reaction of epithelial damage, together with necrotic changes in basement membrane and intertubular connective tissue. She observed the epithelial necrosis, rupture of epithelial layer and sloughing of the epithelium after chronic exposure of lead and zinc. Phirke (2008) studied the toxicity of pesticides quinalphos and thiodan on freshwater bivalve *Parreysia corrugata.* Patil (2010) reported LC50 values for the pesticides indoxacarb and thiamethoxam exposed to freshwater bivalve *Parreysia cylindrica*.

Many investigators have reported toxicant induced histopathological abnormalities and degenerative changes in certain tissues of various animals (Chakraborty *et al.,* 2010; Shaikh and Mane, 2013). In present investigation study the results of acute exposure to Monocrotophos for 5 and 10 days duration induced significant pathological changes in histology of gills and mantle which after the normal tissue architectures. All the histopathological observations indicated that exposure to sub lethal concentrations of Monocrotophos caused degenerative changes to some extent in gill and mantle tissues of animal.

REFERENCES

1. Bhattacarya, S. and Ray, A. K. (1984). Histopathological changes in hepatopacrease of fresh water airbreathing teleost, Anabas testudiness (Bloch) exposed to acute and chronic level of Cytion J. Carr.Bioo. 1:170-174.
2. Goel, K. A. and Garg, V. (1992). Histopthological changes produced in the liver and kidney of *Channa punctatus* after chronic exposure to 2, 3, 4-triaminobenzine Bull. Environ. Contam. Toxicol. 25: 330-334.
3. Gulbhile, S. D. (2006). Caffeine (1,3,7 Trimethylxanthine) supplementation: possible recovery in mercury and arsenic induced alteration in the freshwater bivalve, *Lammelideins corrianus*. Ph. D. thesis submitted to Dr. Babasaheb Amedkar Marathwad University, Aurangabad. (M.S.), India.
4. Jawale, R. S. (2006). Ascorbate effect on certain heavy metal induced physiological alteration in the freshwater bivalve, *Lamellidens corrians*. Ph. D. thesis submitted to Dr. B. A. M. University, Aurangabad. (MS), India.
5. Shatry, K. V. and Sunita, S. (1984). Chronic effect of chromium in *Channa punctatus*. J Environmental Biology. 5(1): 47-52.
6. Shrivastava, V. M .S. and Maurya, R. S. (1991). Effect of chromium Stress on gill and intestine of *Mystus vttatus* (Block) scaning E. M. Study J. Ecobiology. 3: 69-71.
7. Simkiss, K. (1983). Metal ions: metabolic toxic effects. In "the mollusca" Vol. 2. Environmental Biochmistry and physiology. PP 100-164, ediated by Hochashka, P. W. Academic press, New York.
8. Sprague, J. B. (1971). The measurement of pollutant toxicity to fish III, sub lethal effect and safe concentration. Water Res. 5:245- 266.
9. Chaudhari, T.R. 1988. Pesticidal impact on some physiological aspect of *Bellamya (viviparous) bengalensis.* Ph.D. thesis Dr. B.A.M.U., Aurangabad.
10. Cripe, G.M. 1994. Coparative acute toxicants of several pesticides and metals to *Mysidopsis bahia* and post laval *Panaeus duorarum*. *Environ. Toxicol. Chem.* 13:1897-72.
11. Gill T. S., Pant J. C. and Pant Jaishree (1988). Gill, liver and kidney lesions associated with experimental exposures to carbaryl and dimethoate in the fish (*Puntius conchonius* Ham.). Bull. Environ. Contam. Toxicol. 41, 71 – 78.
12. Jadhav S.M. 1993. Impact of pollutants on some physiological aspects of the freshwater bivalve, *Corbicula striatella*. Ph.D. Thesis, Marathwada University, Aurangabad. (M. S.).
13. Milan L.S. and Mulla M.S. (1991). Effects of pyrethroid Insecticides on non-target Invertebrates in Aquatic Ecosystems . *J. Agric. Entomol.* 9(2): 73-96.
14. Phirke P.P. (2008). Effect of thiodan and quinalphos on some physiological parameters of the freshwater bivalve, *Parreysia corrugata*. Thesis submitted to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
15. Saxena R. and Garg P. (2011). Vitamin E provides protection against In vitro oxidative stress due to pesticide (Chlorpyrifos and Endosulfan) in goat RBC. *GERT Bull. Biosci.* (Article in Press).
16. Swarup D. Patra, Naresh R.C., Ram., Puneet K., Pallav S. and Balagangatharathilagar M. (2006). Efficiency of copper and cobalt in goats reared around lead zinc smelter. *Small Ruminant sRes.* 63(3): 309-313.